

Incidence of indications for tonsillectomy and frequency of evidence-based surgery

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DOI:

[10.3399/bjgp18X699833](https://doi.org/10.3399/bjgp18X699833)

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Document Version

Peer reviewed version

Citation for published version (Harvard):

Sumilo, D, Nichols, L, Ryan, R & Marshall, T 2019, 'Incidence of indications for tonsillectomy and frequency of evidence-based surgery: A 12-year retrospective cohort study of primary care electronic records', *British Journal of General Practice*, vol. 69, no. 678, pp. e33-e41. <https://doi.org/10.3399/bjgp18X699833>

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Seven in eight tonsillectomies are unnecessary: a 12 year retrospective cohort study of UK children

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Abbreviations:

NHS – National Health Service

Table of Contents Summary

We analyse electronic medical records to determine the proportion of UK tonsillectomies undertaken that are evidence-based and the proportion of eligible children undergoing tonsillectomy

Text: 3031 words

Abstract: 250 words

Contributors' statement

Professor Tom Marshall had the original idea for the research.

Dr Ronan Ryan, Dr Dana Šumilo and Professor Tom Marshall designed the study.

Initial data extraction was carried out by Dr Ronan Ryan and subsequent data extraction by Dr Linda Nichols.

Dr Ronan Ryan, Dr Linda Nichols and Dr Dana Sumilo undertook analysis of the data.

All authors contributed to writing and revising the manuscript. All authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

Abstract

Background

Neither the incidence of indications for childhood tonsillectomy nor the proportion of tonsillectomies that are evidence-based are known.

Aim

Determine the incidence of indications for tonsillectomy in UK children and the proportion of tonsillectomies meeting evidence-based criteria.

Design & Setting

A retrospective cohort study of electronic medical records of children aged 0-15 years registered with 739 UK general practices contributing to a research database.

Method

Children with recorded indications for tonsillectomy were identified from electronic medical records. Evidence-based indications included documented sore throats of sufficient frequency and severity (Paradise criteria); aphthous stomatitis, pharyngitis and cervical adenitis syndrome (PFAPA); or tonsillar tumour. Other indications were considered non-evidence-based. The numbers of children subsequently undergoing tonsillectomy were then identified. Among children who had undergone tonsillectomy the numbers with evidence-based and non-evidence-based indications for surgery were determined.

Results

We included 1,630,807 children, followed up for 7,200,159 person years between 2005 and 2016. Incidence of evidence-based indications for tonsillectomy was 4.2 per 1000 person years: 13.6% (2,144/15,760) underwent tonsillectomy. Incidence of childhood tonsillectomy was 2.5 per 1000 person years: 11.7% (2,144/18,281) had evidence-based indications, almost all with Paradise criteria. The proportion of evidence-based tonsillectomies was unchanged over 12 years. Most childhood tonsillectomies followed non-evidence-based indications: 5 to 6 sore throats (12.4%) or 2 to 4 sore throats (44.6%) in one year; sleep disordered breathing (12.3%) or obstructive sleep apnoea (3.9%).

Conclusion

In the UK, few children with evidence-based indications undergo tonsillectomy and 32,500 children annually undergo tonsillectomies from which they are unlikely to benefit.

Keywords

Tonsillectomy; evidence-based medicine; children; primary care

How this fits in

Evidence suggests tonsillectomy is effective in children with frequent, documented sore throats but not in less severely affected children and there is insufficient evidence to recommend its use for breathing difficulties.

We found that each year between 2005 and 2016, about 4 in 1000 UK children had sufficient sore throats to meet evidence-based criteria for tonsillectomy but only about one in seven ever had the operation. This suggests tonsillectomy is far from essential.

Over the same time period 2 to 3 in 1000 children underwent tonsillectomy each year of whom one in eight of these met evidence-based criteria, amounting to about 32,500 unnecessary tonsillectomies annually at a cost of £36.9 million.

Introduction

Tonsillectomy is the most common surgical procedure in children. Tonsillectomy rates in Belgium, Finland and Norway are twice the UK rate, but in Spain, Italy and Poland rates are much lower.¹ Childhood tonsillectomy rates in the USA are three times higher than England,^{2,3} rates vary four-fold within New England and seven-fold within England (UK).^{4,5} These variations are hard to explain in terms of need. The National Health Service (NHS) carried out approximately 37,000 childhood tonsillectomies from April 2016 to March 2017 at a cost of £42.0 million.^{2,6}

Complications of tonsillectomy are more common than with other common childhood surgical procedures; 2.7% of children are readmitted within 30 days and 12.4% present to emergency departments often as a result of haemorrhage.⁷ Deaths occur occasionally.⁸ Tonsillectomy may have long-term effects on the frequency of respiratory, infectious and allergic conditions.⁹

Recurrent or chronic sore throat is the most common indication for tonsillectomy in the UK.¹⁰ Evidence indicates tonsillectomy results in modest, short term reductions in recurrent sore throats in severely affected children (aged 3 to 15 years) but is not worthwhile in less severely affected children.^{11,12,13} UK and US evidence-based guidelines therefore suggest offering tonsillectomy for children with ≥ 7 documented sore throats in a year; ≥ 5 yearly in two successive years; or ≥ 3 three yearly in three successive years: the Paradise criteria.^{2,14,15} Sore throats should be characterised by at least one of the following: lymphadenopathy, tonsillar pus, fever, or evidence of Streptococcal infection. As undocumented sore throats have a more benign prognosis, eligibility requires documentation.¹⁶ The evidence base has not fundamentally changed since 2002.^{17,18} Tonsillectomy may also be carried out for tonsillar tumour. It may be effective in aphthous stomatitis, pharyngitis and cervical adenitis syndrome (PFAPA).¹⁹

Other potential indications for tonsillectomy lack convincing evidence. Only uncontrolled studies have evaluated tonsillectomy for recurrent peritonsillar abscess.²⁰

Adenotonsillectomy results in short term improvements in quality of life in children aged 5 to 9 years with polysomnography-confirmed obstructive sleep apnoea.²¹ However its long-term value is debatable, tonsillectomy is unevaluated for snoring and of limited effectiveness for sleep apnoea unconfirmed by polysomnography.¹³ Trials of tonsillectomy for sleep apnoea are ongoing.^{22,23,24} Only very small non-randomized studies have evaluated tonsillectomy for guttate or chronic plaque psoriasis in children.²⁵ Randomized controlled trial evidence does not show tonsillectomy affects clinical remission of glomerulonephritis.²⁶

No previous population wide study has described the epidemiology of potential indications for tonsillectomy or how many of those with different potential indications undergo tonsillectomy. This analysis therefore has three aims: to describe the incidence of potential indications for tonsillectomy in children, to determine the proportion of children undergoing tonsillectomy who met evidence-based criteria and to investigate if there have been changes in the potential indications over time. We hypothesize a mismatch between the evidence base and tonsillectomies performed: 1) most tonsillectomies are undertaken in children who are not eligible; 2) many eligible children do not undergo tonsillectomy.

Methods

Data Source and Study Cohort

This is a retrospective open cohort study of children aged 0 to 15 years, registered with a general practice contributing to The Health Improvement Network (THIN). THIN is a database of anonymized patient records from over 700 UK general practices. It contains information on diagnoses, symptoms, referrals to secondary care, tests and treatments in primary care.²⁷ It is broadly generalizable to the UK population in terms of demographics and medical condition prevalence.^{28,29}

The researchers had complete access to the full THIN database. Data were only included after the date of practice acceptable mortality reporting. This is the date after which patient deregistrations in each practice were recorded consistently, ensuring that the denominator, the registered population, was accurate.³⁰ Children were eligible for inclusion from birth, or if not registered with a THIN practice from birth, then registered for at least three years prior to entry. This allows sufficient time to meet the evidence-based criteria for tonsillectomy. The earliest year of entry to the cohort was set to 2000.

Children who had a tonsillectomy prior to entry in the cohort were excluded. Patients were followed up until the earliest of the following dates: age 16 years; death; leaving the practice (deregistration); last data extraction from the practice; or tonsillectomy.

Exposures

Potential indications for tonsillectomy were identified from clinical coded consultations for sore throat episodes, tonsillar neoplasia, PFAPA, peritonsillar abscess, sleep apnoea, other sleep disordered breathing, glomerulonephritis and guttate and chronic plaque psoriasis. As it is difficult to distinguish new sore throat episodes from ongoing episodes a pragmatic decision was taken to consider any consultation for sore throat (including pharyngitis,

tonsillitis, throat infection, sore throat symptoms) at least 14 days after the previous consultation as a new episode. Code lists are provided in supplementary appendices. Patients were categorized according to potential indications for tonsillectomy.

In initial analysis we were unable to identify any potential indications for some patients who underwent tonsillectomy. This may have occurred because some consultations for sore throats were recorded using a less specific code such as another upper respiratory tract infection. We therefore broadened the definition of a sore throat consultation to include any consultations with a clinical code for upper respiratory tract infection or otitis media. We also conducted a sensitivity analysis, including in our counts of sore throat episodes any consultations where no code for upper respiratory tract infection was used but an oral antibiotic commonly used for sore throat (Penicillin V, Erythromycin or Clarithromycin) was prescribed.

Incidence of potential indications for tonsillectomy

To calculate the annual incidence of evidence-based indications for tonsillectomy we determined the number of children who met at least one evidence-based indication in any given year. Evidence-based indications included: tonsillar neoplasia; PFAPA; ≥ 7 sore throat episodes sore throats in the preceding year, ≥ 5 yearly in the two preceding years, or ≥ 3 yearly in the three preceding years (Paradise criteria for sore throats).¹⁴

Proportion of tonsillectomies that are evidence-based

Indications for tonsillectomy were ranked to determine the strongest indication (based first on strength of evidence then on clinical consensus reflected in current practice) and this was taken to be the true indication for tonsillectomy. Tonsillar neoplasia was considered the strongest indication for tonsillectomy, followed by: PFAPA and Paradise criteria for sore throats. These indications for tonsillectomy were considered to be evidence-based. The next strongest indications were considered sequentially to be obstructive sleep apnoea, other sleep

disordered breathing, peritonsillar abscess; ≥ 5 sore throat episodes recoded in the preceding year but not meeting the Paradise criteria; recurrent sore throat episodes accompanied by guttate or chronic plaque psoriasis, or glomerulonephritis; three to four, two and one sore throat episodes in the preceding year (the weakest indication).

We initially considered tonsillectomy to be indicated for one year after the patient consulted with the indication. In each child who underwent tonsillectomy we also identified the strongest indication at any time prior to surgery based on available patient records. This could overestimate the number of tonsillectomies considered evidence-based if an older child had tonsillectomy for an indication that was not evidence-based but they had a prior history of stronger indications.

Changes to the analysis

In initial analysis, when we considered tonsillectomy to be indicated only one year after the onset of the indication (e.g. up to one year after the seventh sore throat), no apparent indication could be identified for 19.1% (4,406/23,116) of tonsillectomies between 2000 and 2016. When we considered tonsillectomy to be indicated at any time after the indication, the proportion of tonsillectomies with no indication fell to 5.4% (1,246/23,116). Over 10% of tonsillectomies had no identifiable indication in the early years of the cohort (10.2% in 2000 and 2001), but was lower from 2005 onwards. The primary analysis therefore allowed indications at any time prior to tonsillectomy and was confined to 2005 to 2016.

Outcome

The main outcome of interest was tonsillectomy or adenotonsillectomy.

Statistical Analysis

Incidence of potential indications for tonsillectomy

The annual incidence of potential indications for tonsillectomy was calculated as the number of children who met at least one potential indication for tonsillectomy in each year per person

year of follow up. We then determined the annual incidence of evidence-based indications for tonsillectomy to estimate potential annual need for tonsillectomy.

The strongest indication for tonsillectomy was determined for each child in the cohort and the proportion of children undergoing tonsillectomy after this strongest indication was calculated.

Incidence of tonsillectomy and indications for tonsillectomies undertaken

The annual incidence of tonsillectomy was estimated as the number of children undergoing the procedure per person year of follow up. Incidence estimates were directly standardized to the 2015 UK population³¹ to enable comparisons over time: 95% confidence intervals (CIs) were calculated using Poisson approximation.

For each tonsillectomy the strongest potential indication at any time prior to surgery was identified and the proportion of tonsillectomies attributed to each indication determined.

Potential indications were then categorized as evidence-based or not evidence-based and the proportion of evidence-based tonsillectomies calculated. Data were analysed using Stata version 14.³²

Results

During 2005-2016 the cohort included 739 general practices, 1,630,807 children aged 0-15 years, 7,200,159 person years of follow up and 18,281 tonsillectomies (Table 1).

Annual incidence of indications for tonsillectomy

Sore throat consultations declined from 2005 to 2016. Incidence of sore throats meeting Paradise criteria (98.0% of evidence-based indications) was 28% lower in 2016 than 2005. (Table 1). Similarly consultations for 5 to 6 sore throats in a year fell by 27%; for 3 to 4 recurrent sore throats fell by 22%; for 2 to 3 sore throats by 19%; by 13% for a single sore throat. Consultations for peritonsillar abscess also fell by 39%. By contrast consultations for sleep apnoea rose 48% from 2005 to 2016 and those for sleep disordered breathing rose 2%.

Between 2005 and 2016 the average annual incidence of meeting at least one evidence-based indication for tonsillectomy in children was 4.2 per 1,000 person years. A much larger number of children consulted with other potential indications for tonsillectomy which did not meet evidence-based criteria, particularly with one, two, or three to four sore throats in a year. (Table 2)

Frequency of tonsillectomy in children with indications

Few children 13.6% (2,144/15,760) with an evidence-based indication underwent tonsillectomy. Likelihood of undergoing tonsillectomy increased with frequency of sore throat consultations in a single year: 3.2% (5,503/170,687) with 3 to 4 sore throats, 8.9% (2,266/25,420) with 5 to 6 annual sore throats and 13.9% (2,129/15,320) of those meeting Paradise criteria. The vast majority of children consulting with recurrent sore throats did not undergo tonsillectomy however the small proportion that did accounted for most tonsillectomies. (Figure 1) The indications most likely to be followed by tonsillectomy were

sleep apnoea, 22.2% (706/3,185), followed by peritonsillar abscess 14.8% (100/675) and sleep disordered breathing 14.8% (2,246/15,205). (Table 2)

Annual Incidence of tonsillectomy

The crude annual incidence of tonsillectomy was 2.5 per 1000 person years. It followed a broadly similar pattern to the incidence of indications, declining from 2005 to 2011 and then remaining relatively stable (Table 1). Age-adjustment had little effect on trends or rates.

Annual English hospital-reported tonsillectomy rates showed the same temporal pattern as our primary care data.

Indications for tonsillectomies undertaken from 2005 to 2016

From 2005 to 2016 11.7% (2,144/18,281) of tonsillectomies had evidence-based indications, 99.3% of these met the Paradise criteria. Tonsillectomies without an evidence base were mainly for sore throats: five to six (12.4%), two to four (44.7%) or one (9.9%) within a single year. In addition, 3.9% were for sleep apnoea and 12.3% for other sleep disordered breathing.

The proportion of tonsillectomies attributable to Paradise criteria, five or six annual sore throats or to other sleep disordered breathing changed little. The proportion attributable to obstructive sleep apnoea increased fourfold from 1.2% to 5.5%. (Figure 2)

Discussion

Summary of findings

About four in 1,000 children met evidence-based criteria for tonsillectomy annually between 2005 and 2016. The vast majority had recurrent sore throat consultations meeting Paradise criteria. Fewer than one in seven underwent surgery.

Two or three children in 1000 underwent tonsillectomy annually between 2005 and 2016. Fewer than one in eight had evidence-based indications. The proportion did not change over twelve years. In the UK 32,500 of the 37,000 childhood tonsillectomies in 2016 to 2017 were therefore unnecessary. Most (54.5%) tonsillectomies were carried out on the very large numbers of children who consulted with one to four sore throats in a year but the vast majority of these children do not undergo tonsillectomy. The mismatch between children meeting evidence-based criteria and those undergoing tonsillectomy is shown in Figure 3.

Strengths and limitations

Our findings are obtained from a very large dataset reflecting current UK clinical practice over 12 years and captures both free NHS and private tonsillectomies. Our tonsillectomy rates correlated closely with childhood tonsillectomy rates reported in England Hospital Episode Statistics ($r = 0.896$).

We identified likely indications for 95.2% of tonsillectomies from clinically coded consultations. Consultations in primary care are 15 times more common than in emergency departments and upper respiratory infections is uncommon in the latter therefore primary care records will miss few relevant consultations.^{33,34}

Paradise criteria require specific documentation of sore throats and their clinical features. Our broad (sensitive) definition of a sore throat, counting any upper respiratory tract infection consultation as a sore throat episode, may overestimate the frequency of evidence-based

indications. In sensitivity analyses we investigated the effect of using an even broader (more sensitive) include any consultation without a clinical code where antibiotics consistent with a sore throat episode were prescribed (Penicillin V, Erythromycin or Clarithromycin). This increased the number of evidence-based tonsillectomies to 17.5%. We then used a narrower (more specific) definition of a sore throat, including only those clinically coded as sore throat episodes. This reduced the proportion of evidence-based tonsillectomies to 4.4%, reduced the proportion of tonsillectomies attributable to sore throat to 70.9% and increased the proportion without an identifiable indication to 11.1%. Under all scenarios only a minority of tonsillectomies were evidence based and even with the narrowest definition of sore throat, only a minority (32.0%) of children meeting Paradise criteria underwent tonsillectomy.

For sore throat related indications we initially intended to consider tonsillectomy to be indicated for only one year after the patient last consulted for the indication. But median time from indication to tonsillectomy was 356 days and applying a one year time limit for indications meant we were unable to identify any indications for an additional 13% of tonsillectomies. We therefore identified the best ever indication rather than indications within the year prior to tonsillectomy, this may overestimate the frequency of evidence-based indications.

Some may consider there is sufficient evidence to support tonsillectomy for other indications. Children affected by recurrent otitis media may benefit modestly from adenotonsillectomy although it is unclear if tonsillectomy adds to the benefits of adenoidectomy.³⁵ Tonsillectomy may be beneficial for sleep apnoea confirmed by polysomnography in five to nine year olds, for peritonsillar abscess or for psoriasis.^{19,20,25} Others conclude the evidence does not support tonsillectomy in PFAPA.³⁶ But a combination of evidence-based indications, or breathing related indications or peritonsillar abscess accounts for only 28.4% of tonsillectomies.

Furthermore, most children with any of these indications do not undergo tonsillectomy. Using

a broader definition of eligibility for treatment increases the proportion of tonsillectomies that can be considered indicated, but decreases the proportion of eligible children who undergo surgery.

Comparison to literature

This is the first ever study to estimate the incidence of evidence-based indications for tonsillectomy in children and the proportion of affected children who undergo the procedure. It is the first study to comprehensively estimate the proportion of tonsillectomies that are evidence-based. A study in 23, self-selected, UK general practices found a quarter of 237 tonsillectomies in the late 1990s met evidence-based criteria.³⁷ A larger analysis suggested <1% of tonsillectomy patients in 2008 met Paradise criteria.³⁸ However this study probably underestimated eligibility as it required sore throats to be precisely coded in general practice records.

Although others report rising hospital admissions for peritonsillar abscess, we found primary care consultations for peritonsillar abscess and for recurrent sore throat consistently declined over the same period.³⁹ This suggests a changing pattern of presentation rather than an increase in incidence.

We found UK tonsillectomy rates changed little from 2005 to 2016, with a slight decline in the years to 2011, followed by a modest increase. By comparison, in Germany childhood tonsillectomy rates decreased by 17.3% from 2010 to 2013 but rates remain twice those in the UK.⁴⁰ We found an increasing propensity for sleep apnoea consultations to result in tonsillectomy: sleep apnoea consultations increased by about half but tonsillectomies for obstructive sleep apnoea increased four-fold. Overall our attribution of indications for childhood tonsillectomy – 78.5% sore throat, 16.2% obstructive symptoms and 0.5% peritonsillar abscess – is comparable to a national UK audit – 83.3%, 14.7% and 0.4%

respectively.¹⁰ Fewer tonsillectomies could be attributed to sleep apnoea than the 25% suggested by UK professional bodies⁴¹ or the two thirds reported from the USA.^{42,43}

We found guideline discordant (overtreatment alongside possible under treatment) clinical management of recurrent sore throat in the UK to be stable over many years. Overtreatment is an increasingly recognized phenomenon.^{44,45} Guideline discordant clinical management has been observed in relation to both statins and depression and in the USA has increased in relation to back pain and headache.^{46,47,48,49}

Implications for practice and research

We await the results of current trials of tonsillectomy for obstructive sleep disordered breathing.^{22,23,24} High quality randomized controlled trials are also needed to evaluate tonsillectomy for peritonsillar abscess, guttate and chronic plaque psoriasis. The frequency of indications for tonsillectomy and evidence-based tonsillectomies should be investigated in countries with higher and lower tonsillectomy rates than the UK.

Our findings have some practical implications for UK clinical practice. Because they are undertaken on children who do not benefit, most tonsillectomies may cause more harm than good. This is ethically dubious and cannot be a good use of resources. Most children meeting evidence based criteria do not undergo tonsillectomy, therefore it cannot be considered a necessity. We should already inform parents of the likely effectiveness of tonsillectomy. We can now also inform them that most children with either recurrent sore throats or sleep apnoea do not undergo tonsillectomy.

Additional information**Ethical approval:**

All research using anonymised patient records from THIN has prior approval from the NHS

South-East Multi-centre Research Ethics Committee subject to independent scientific review.

This study received THIN Scientific Review Committee approval (reference 15-003).

Funding:

There was no external funding for this manuscript. Professor Tom Marshall is partly funded by the NIHR through the Collaborations for Leadership in Applied Health Research and Care for West Midlands (CLAHRC-WM). The views expressed in this publication are not necessarily those of the NIHR, the Department of Health, NHS Partner Trusts, University of Birmingham or CLAHRC-WM.

Competing interests:

The authors have indicated they have no relevant financial relationships to disclose.

The authors have no potential conflicts of interest to disclose.

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Data sharing

Data sharing: the full dataset will be made available to researchers on request from the corresponding author. Individual consent was not obtained but the presented data are anonymized and risk of identification is low.

Patient and lay involvement

Patients and lay people were not involved in the design of this study or the development of the research question.

Tables and figures

Table 1: Characteristics of the study population from 2005 to 2016

	Year											
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Number of practices	556	577	603	643	654	648	649	662	644	609	545	451
Number of children	590,724	622,505	651,308	694,342	720,955	724,153	730,833	753,756	746,245	705,936	643,183	530,462
Person years	524,613	560,254	586,007	614,620	646,898	649,855	661,183	674,169	662,071	617,813	544,197	458,480
Mean age (years)	7.9	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8	7.8
No. of males	307,925	323,551	337,702	358,948	371,608	372,224	374,953	386,071	381,930	361,168	328,770	271,135
(%)	(52.1)	(52.0)	(51.9)	(51.7)	(51.5)	(51.4)	(51.3)	(51.2)	(51.2)	(51.2)	(51.1)	(51.1)
Townsend quintile † (%)												
Least deprived 1	24.4	24.8	24.8	24.2	24.1	24.0	23.4	22.6	21.9	21.3	20.5	18.6
2	19.2	19.2	19.2	19.5	19.6	19.5	19.4	18.9	18.5	18.4	18.3	17.4
3	19.2	19.0	19.1	19.4	19.6	19.6	19.7	19.6	19.5	19.7	19.4	19.0
4	17.2	17.1	17.0	17.0	17.2	17.2	17.3	17.6	17.8	17.7	17.8	17.4
Most deprived 5	12.6	12.3	12.5	12.5	12.6	12.6	12.6	13.0	13.1	13.2	13.4	13.9
Not known	7.4	7.6	7.4	7.5	6.9	7.3	7.7	8.4	9.1	9.8	10.7	13.8
No. of children with Evidence Based Indications*	2,359	2,483	2,587	2,689	2,699	2,722	2,768	2,864	2,948	2,692	2,155	1,494
(per 1,000 Person Years)	(4.5)	(4.4)	(4.4)	(4.4)	(4.2)	(4.2)	(4.2)	(4.2)	(4.5)	(4.4)	(4.0)	(3.3)
No. of Tonsillectomies	1,555	1,551	1,648	1,620	1,599	1,564	1,468	1,581	1,698	1,598	1,275	1,124
(per 1,000 Person Years)	(3.0)	(2.8)	(2.8)	(2.6)	(2.5)	(2.4)	(2.2)	(2.3)	(2.6)	(2.6)	(2.3)	(2.5)

* A child who consults with an evidence-based indication can be eligible for tonsillectomy in more than one calendar year if the indication crossed the calendar year. The total number of children consulting with evidence based indications over 12 years is therefore smaller than the sum of the number for each year. † Townsend score is an area based measure of deprivation.

Table 2: Numbers of children with potential indications for tonsillectomy, annual incidence of potential indications and the proportions of these children undergoing tonsillectomy (2005 to 2016)

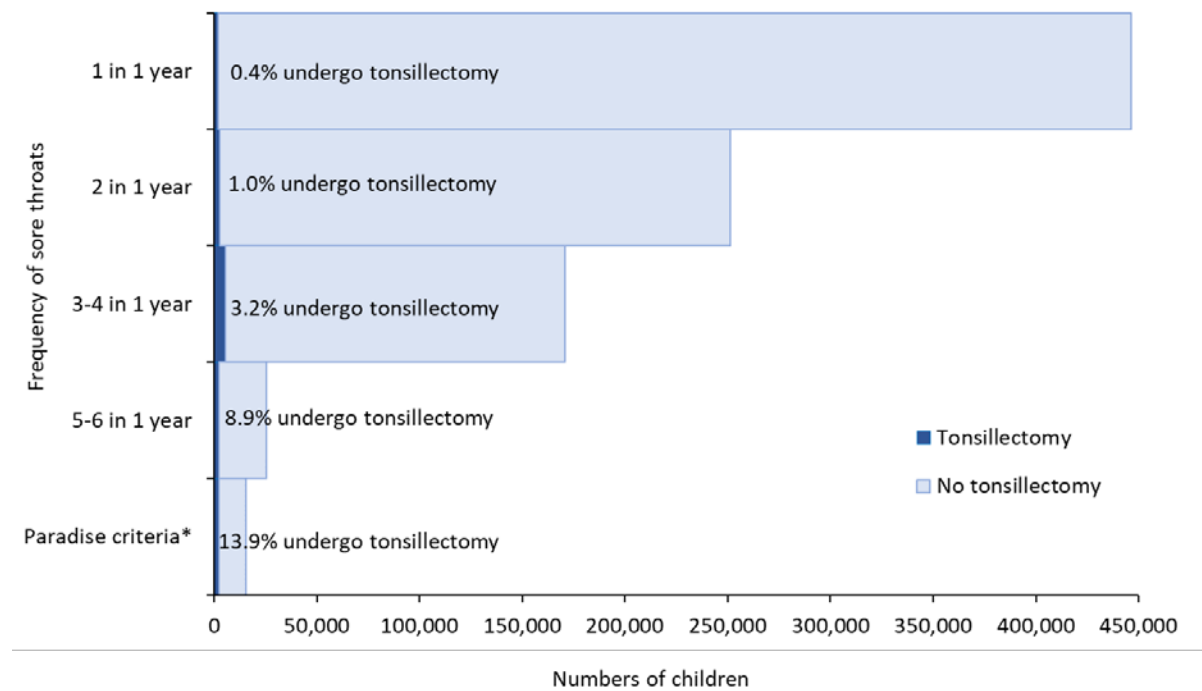
Recorded indication for tonsillectomy*		Number with this indication	Proportion with this indication undergoing tonsillectomy (%)	Proportion of all tonsillectomies attributable to this indication (%)	Average annual incidence of this indication (per 100,000 Person Years)
Evidence-based	Tonsillar tumour	5	0.0	0.0	0.2
	Aphthous stomatitis, pharyngitis and cervical adenitis syndrome (PFAPA)	435	3.4	0.1	8.5
	Paradise criteria‡	15,320	13.9	11.6	412.8
Non evidence-based	Obstructive sleep apnoea	3,185	22.2	3.9	65.9
	Other sleep disordered breathing	15,205	14.8	12.3	369.9
	Peritonsillar abscess	675	14.8	0.5	14.9
	Recurrent sore throats: 5 to 6 in one year†	25,420	8.9	12.4	840.4
	Recurrent sore throats: 2 to 4 in one year with guttate or chronic plaque psoriasis†	939	3.7	0.2	21.3
	Recurrent sore throats: 2 to 4 in one year with glomerulonephritis†	148	4.7	0.0	3.5
	Recurrent sore throats: 3 to 4 in one year†	170,687	3.2	30.1	5,869.1
	Recurrent sore throats: 2 in one year†	251,247	1.0	14.3	12,321.6
	Recurrent sore throats: 1 in one year†	446,275	0.4	9.9	27,896.5
	No indication identified	701,266	0.1	4.7	n/a
Total		1,630,807	1.1	100.0	n/a

*If a child met criteria for several indications, the indication higher in the hierarchy would be counted.

†Broad definition of sore throat: includes consultations for any upper respiratory tract infection or otitis media

‡Paradise criteria: Recurrent sore throats or upper respiratory tract infections: ≥ 7 a year; ≥ 5 yearly for two years; ≥ 3 yearly for three years

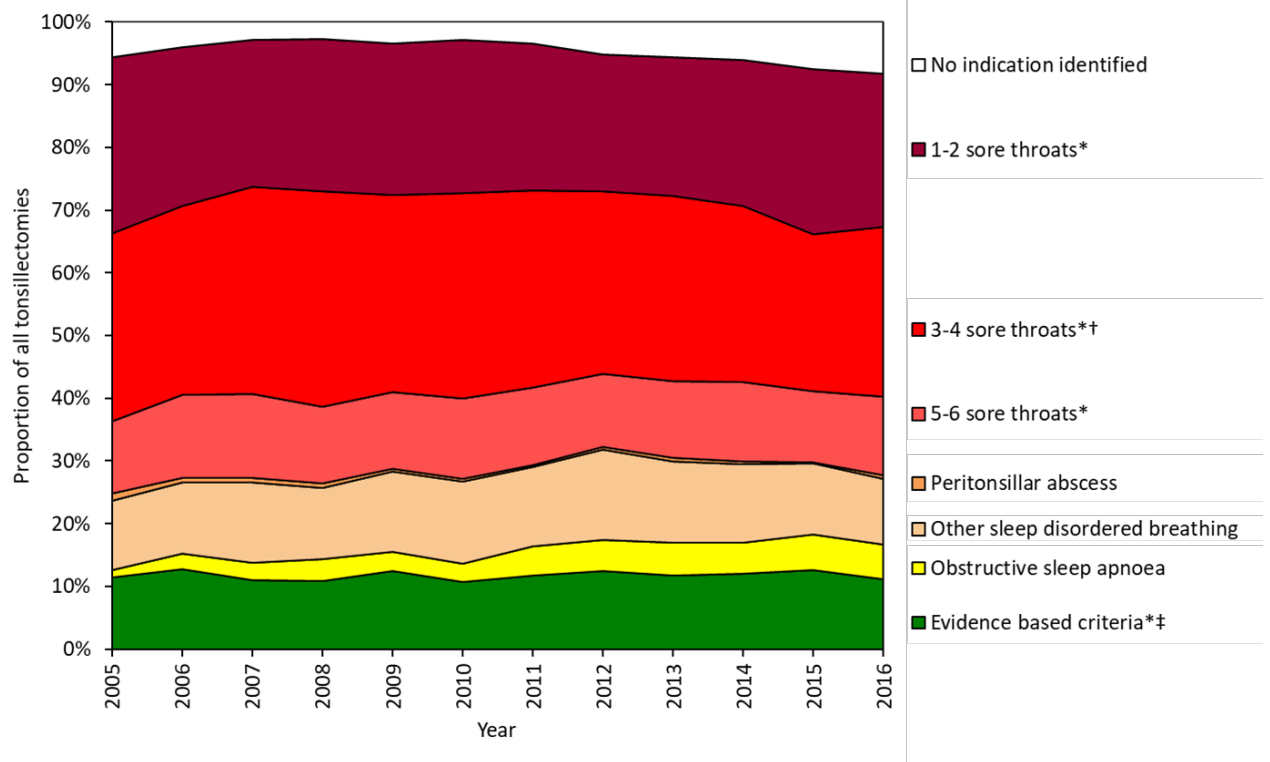
Figure 1: Numbers of children consulting for sore throats[†] and numbers undergoing tonsillectomy (2005 to 2016).



[†]Broad definition of sore throat: includes consultations for any upper respiratory tract infection or otitis media

* Paradise criteria: Recurrent sore throats or upper respiratory tract infections: ≥ 7 a year; ≥ 5 yearly for two years; ≥ 3 yearly for three years

Figure 2: Percentages of tonsillectomies due to different indications 2005-2016

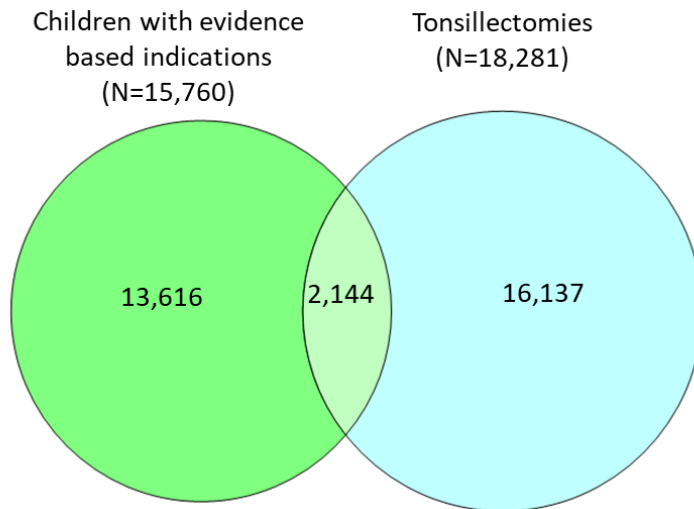


* Broad definition of sore throat: includes consultations for any upper respiratory tract infection or otitis media
† 3-4 sore throats include children with guttate, chronic plaque psoriasis and glomerulonephritis with recurrent sore throats (these, however accounted only for 0.5% of all children in this group of recurrent sore throats who had tonsillectomy)

Paradise criteria: Recurrent sore throats or upper respiratory tract infections: ≥ 7 a year; ≥ 5 yearly for two years; ≥ 3 yearly for three years

‡ Evidence-based criteria include Paradise criteria, PFAPA and tonsillar tumour (the last two accounted for 0.7% of all tonsillectomies meeting evidence-based criteria)

Figure 3: Relationship between number of children meeting evidence-based criteria (Paradise criteria, PFAPA or tonsillar tumour) for tonsillectomy and numbers of children undergoing tonsillectomy from to 2005-2016



Appendices: Clinical code lists

Appendix 1: Read code list for neoplastic growths of the tonsil

Code	Description
B016.00	Malignant neoplasm of lingual tonsil
B060.00	Malignant neoplasm of tonsil
B060000	Malignant neoplasm of faucial tonsil
B060100	Malignant neoplasm of palatine tonsil
B060200	Malignant neoplasm of overlapping lesion of tonsil
B060z00	Malignant neoplasm tonsil NOS
B061.00	Malignant neoplasm of tonsillar fossa
B062.00	Malignant neoplasm of tonsillar pillar
B062300	Malignant neoplasm of palatopharyngeal arch
B062z00	Malignant neoplasm of tonsillar fossa NOS
B071100	Malignant neoplasm of pharyngeal tonsil
B072000	Malignant neoplasm of pharyngeal recess
B701300	Benign neoplasm of lingual tonsil
B705.00	Benign neoplasm of tonsil
B706000	Benign neoplasm of tonsillar fossa
B706100	Benign neoplasm of anterior tonsillar pillar
B706200	Benign neoplasm of posterior tonsillar pillar
B706500	Benign neoplasm of oropharyngeal wall
B707000	Benign neoplasm of nasopharyngeal roof
B707100	Benign neoplasm of pharyngeal tonsil
B707200	Benign neoplasm of pharyngeal recess
B707300	Benign neoplasm of nasopharyngeal floor
B708300	Benign neoplasm of posterior hypopharyngeal wall

Appendix 2: Read code list for PFAPA

Code	Description
133E.00	Aphthous stomatitis
A784.11	Aphthous fever
J082100	Major aphthous ulceration
J082200	Recurrent aphthous ulceration
J082400	Aphthous stomatitis

Appendix 3: Read code list for sore throat and other upper respiratory tract infections

Code	Description
1C9..00	Sore throat symptom
1C9..11	Throat soreness
1C92.00	Has a sore throat
1C93.00	Persistent sore throat
1C9Z.00	Sore throat symptom NOS
1CB..00	Throat symptom NOS
1CB3.00	Throat pain
1CB3.11	Pain in throat
1CB5.00	Throat irritation
1CBZ.00	Throat symptom NOS
2DB6.00	O/E - follicular tonsillitis
2DC2.00	O/E - granular pharyngitis
2DC3.00	Inflamed throat
A34..00	Streptococcal sore throat and scarlatina
A340.00	Streptococcal sore throat
A340000	Streptococcal angina
A340200	Streptococcal pharyngitis
A340300	Streptococcal tonsillitis
A340z00	Streptococcal sore throat NOS
A34z.00	Streptococcal sore throat with scarlatina NOS
A383000	Fusobacterial necrotising tonsillitis
A552.00	Postmeasles otitis media
AA12.00	Vincent's pharyngitis
AA1z.11	Vincent's laryngitis
AA1z.12	Vincent's tonsillitis
F510000	Acute otitis media with effusion
F510011	Acute secretory otitis media
F510100	Acute serous otitis media
F510200	Acute mucoid otitis media
F510300	Acute sanguinous otitis media
F510400	Acute allergic serous otitis media
F510500	Acute allergic mucoid otitis media
F510600	Acute allergic sanguinous otitis media
F511.00	Chronic otitis media with effusion, serous
F511.11	Chronic secretory otitis media, serous

Code	Description
F511100	Serosanguinous chronic otitis media
F511z00	Chronic serous otitis media NOS
F512.00	Chronic otitis media with effusion, mucoid
F512.12	Chronic secretory otitis media, mucoid
F512100	Mucosanguinous chronic otitis media
F512z00	Chronic mucoid otitis media NOS
F513.00	Chronic otitis media with effusion, other
F513000	Chronic allergic otitis media
F513100	Chronic otitis media with effusion, purulent
F513111	Chronic secretory otitis media, purulent
F514000	Allergic otitis media NOS
F514100	Serous otitis media NOS
F514200	Catarrhal otitis media NOS
F514300	Mucoid otitis media NOS
F518.00	Chronic otitis media with effusion, unspecified
F52..00	Suppurative and unspecified otitis media
F520.00	Acute suppurative otitis media
F520000	Acute suppurative otitis media tympanic membrane intact
F520100	Acute suppurative otitis media tympanic membrane ruptured
F520300	Acute suppurative otitis media due to disease EC
F520z00	Acute suppurative otitis media NOS
F521.00	Chronic suppurative otitis media, tubotympanic
F522.00	Chronic suppurative otitis media, atticoantral
F523.00	Chronic suppurative otitis media NOS
F524.00	Purulent otitis media NOS
F524000	Bilateral suppurative otitis media
F525.00	Recurrent acute otitis media
F526.00	Acute left otitis media
F527.00	Acute right otitis media
F528.00	Acute bilateral otitis media
F52z.00	Otitis media NOS
FyuP200	[X]Other chronic suppurative otitis media
FyuP300	[X]Otitis media in bacterial diseases classified elsewhere
FyuP400	[X]Otitis media in viral diseases classified elsewhere
H00..00	Acute nasopharyngitis
H00..11	Common cold
H00..12	Coryza - acute
H00..13	Febrile cold
H00..14	Nasal catarrh - acute
H00..15	Pyrexial cold
H00..16	Rhinitis - acute
H01..00	Acute sinusitis
H01..11	Sinusitis

Code	Description
H010.00	Acute maxillary sinusitis
H010.11	Antritis - acute
H011.00	Acute frontal sinusitis
H012.00	Acute ethmoidal sinusitis
H013.00	Acute sphenoidal sinusitis
H014.00	Acute rhinosinusitis
H01y.00	Other acute sinusitis
H01y000	Acute pansinusitis
H01yz00	Other acute sinusitis NOS
H01z.00	Acute sinusitis NOS
H02..00	Acute pharyngitis
H02..11	Sore throat NOS
H02..12	Viral sore throat NOS
H02..13	Throat infection - pharyngitis
H020.00	Acute gangrenous pharyngitis
H021.00	Acute phlegmonous pharyngitis
H022.00	Acute ulcerative pharyngitis
H023.00	Acute bacterial pharyngitis
H023000	Acute pneumococcal pharyngitis
H023100	Acute staphylococcal pharyngitis
H023z00	Acute bacterial pharyngitis NOS
H024.00	Acute viral pharyngitis
H025.00	Allergic pharyngitis
H02z.00	Acute pharyngitis NOS
H03..00	Acute tonsillitis
H03..11	Throat infection - tonsillitis
H03..12	Tonsillitis
H030.00	Acute erythematous tonsillitis
H031.00	Acute follicular tonsillitis
H032.00	Acute ulcerative tonsillitis
H033.00	Acute catarrhal tonsillitis
H034.00	Acute gangrenous tonsillitis
H035.00	Acute bacterial tonsillitis
H035000	Acute pneumococcal tonsillitis
H035100	Acute staphylococcal tonsillitis
H035z00	Acute bacterial tonsillitis NOS
H036.00	Acute viral tonsillitis
H037.00	Recurrent acute tonsillitis
H03z.00	Acute tonsillitis NOS
H04..00	Acute laryngitis and tracheitis
H040.00	Acute laryngitis
H040000	Acute oedematous laryngitis
H040100	Acute ulcerative laryngitis

Code	Description
H040200	Acute catarrhal laryngitis
H040300	Acute phlegmonous laryngitis
H040400	Acute haemophilus influenzae laryngitis
H040500	Acute pneumococcal laryngitis
H040600	Acute suppurative laryngitis
H040w00	Acute viral laryngitis unspecified
H040x00	Acute bacterial laryngitis unspecified
H040z00	Acute laryngitis NOS
H041.00	Acute tracheitis
H041000	Acute tracheitis without obstruction
H041100	Acute tracheitis with obstruction
H041z00	Acute tracheitis NOS
H042.00	Acute laryngotracheitis
H042.11	Laryngotracheitis
H042000	Acute laryngotracheitis without obstruction
H042100	Acute laryngotracheitis with obstruction
H042z00	Acute laryngotracheitis NOS
H043.00	Acute epiglottitis (non strep)
H043.11	Viral epiglottitis
H043000	Acute epiglottitis without obstruction
H043100	Acute epiglottitis with obstruction
H043200	Acute obstructive laryngitis
H043211	Croup
H043z00	Acute epiglottitis NOS
H044.00	Croup
H04z.00	Acute laryngitis and tracheitis NOS
H05..00	Other acute upper respiratory infections
H050.00	Acute laryngopharyngitis
H051.00	Acute upper respiratory tract infection
H052.00	Pharyngotracheitis
H053.00	Tracheopharyngitis
H054.00	Recurrent upper respiratory tract infection
H055.00	Pharyngolaryngitis
H05y.00	Other upper respiratory infections of multiple sites
H05z.00	Upper respiratory infection NOS
H05z.11	Upper respiratory tract infection NOS
H05z.12	Viral upper respiratory tract infection NOS
H12..00	Chronic pharyngitis and nasopharyngitis
H121.00	Chronic pharyngitis
H121.11	Sore throat - chronic
H121000	Simple chronic pharyngitis
H121100	Atrophic pharyngitis
H121200	Granular pharyngitis

Code	Description
H121300	Hypertrophic pharyngitis
H121400	Pharyngitis keratosa
H121500	Pharyngitis sicca
H121600	Chronic follicular pharyngitis
H121z00	Chronic pharyngitis NOS
H122.00	Chronic nasopharyngitis
H12z.00	Chronic pharyngitis and nasopharyngitis NOS
H13..00	Chronic sinusitis
H13..11	Chronic rhinosinusitis
H130.00	Chronic maxillary sinusitis
H130.11	Antritis - chronic
H130.12	Maxillary sinusitis
H131.00	Chronic frontal sinusitis
H131.11	Frontal sinusitis
H132.00	Chronic ethmoidal sinusitis
H133.00	Chronic sphenoidal sinusitis
H134.00	Fistula of nasal sinus
H135.00	Recurrent sinusitis
H13y.00	Other chronic sinusitis
H13y000	Chronic pansinusitis
H13y100	Pansinusitis
H13yz00	Other chronic sinusitis NOS
H13z.00	Chronic sinusitis NOS
H14..00	Chronic tonsil and adenoid disease
H14..11	Adenoid disease - chronic
H14..12	Tonsil disease - chronic
H140.00	Chronic tonsillitis
H140.11	Chronic adenoiditis
H142.00	Adenoid vegetations
H143.00	Chronic adenotonsillitis
H14y.00	Other chronic diseases of tonsils and adenoids
H14y000	Calculus of tonsil
H14y011	Amygdalolith
H14y012	Tonsillolith
H14y100	Cicatrix of tonsil
H14y200	Cicatrix of adenoid
H14y300	Tonsillar tag
H14y400	Tonsil ulcer
H14y500	Caseous tonsillitis
H14y600	Lingular tonsillitis
H14y700	Cyst of tonsil
H14y711	Tonsillar cyst
H14yz00	Other chronic diseases of tonsils and adenoids NOS

Code	Description
H14z.00	Chronic tonsil and adenoid disease NOS
H14z000	Chronic tonsil disease NOS
H14z100	Chronic adenoid disease NOS
H15..00	Peritonsillar abscess - quinsy
H15..11	Quinsy
H16..00	Chronic laryngitis and laryngotracheitis
H160.00	Chronic laryngitis
H160000	Chronic simple laryngitis
H160100	Chronic catarrhal laryngitis
H160200	Chronic hypertrophic laryngitis
H160300	Chronic atrophic laryngitis
H160400	Laryngitis sicca
H160500	Congested larynx
H160z00	Chronic laryngitis NOS
H161.00	Chronic laryngotracheitis
H16z.00	Chronic laryngitis NOS
H1y..00	Other specified diseases of upper respiratory tract
H1y2.00	Other pharyngeal disease NEC
H1y2.11	Other nasopharyngeal disease NEC
H1y2000	Pharyngeal disease unspecified
H1y2200	Parapharyngeal abscess
H1y2300	Retropharyngeal abscess
H1y2600	Pharynx or nasopharynx abscess
H1y2z00	Other pharyngeal disease NOS
H1yz.00	Other upper respiratory tract diseases NOS
H1yzz00	Other upper respiratory tract disease NOS
H271000	Influenza with laryngitis
H271100	Influenza with pharyngitis
Hyu0.00	[X]Acute upper respiratory infections
Hyu0000	[X]Other acute sinusitis
Hyu0100	[X]Acute pharyngitis due to other specified organisms
Hyu0200	[X]Acute tonsillitis due to other specified organisms
Hyu0300	[X]Other acute upper respiratory infections/multiple sites
Hyu2.00	[X]Other diseases of the upper respiratory tract
Hyu2200	[X]Other chronic sinusitis
Hyu2500	[X]Other chronic diseases of tonsils and adenoids
Hyu2800	[X]Other abscess of pharynx
Hyu2900	[X]Other diseases of pharynx
Hyu2A00	[X]Other specified diseases of upper respiratory tract
R041.00	[D]Throat pain
R041.11	[D]Throat discomfort

Appendix 4: Read code list for peritonsillar abscess

Code	Description
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2DB5.00	O/E - tonsils - quinsy present
2DB5.11	O/E - quinsy present
7423200	Incision of retropharyngeal abscess
7426100	Drainage of retropharyngeal abscess
7531100	Drainage of peritonsillar abscess
7531111	Drainage of quinsy
H15..00	Peritonsillar abscess - quinsy
H15..11	Quinsy
H1y2200	Parapharyngeal abscess
H1y2300	Retropharyngeal abscess

Appendix 5: Read code list for obstructive sleep apnoea

Code	Description
8724.00	CPAP - Continuous positive airways pressure
8725.00	Bi-level positive airways pressure therapy
8A43.00	Apnoea alarm monitoring
Fy03.00	Sleep apnoea
Fy03.11	Obstructive sleep apnoea
Fy04.00	Sleep-related respiratory failure
H5B..00	Sleep apnoea
H5B0.00	Obstructive sleep apnoea
Q31y000	Perinatal apnoeic spells NOS
Q31y600	Apnoea of newborn
Q31y611	Neonatal apnoeic attack
Qyu3800	[X]Other apnoea of newborn
R005100	[D]Insomnia with sleep apnoea
R005300	[D]Hypersomnia with sleep apnoea
R005311	[D]Sleep apnoea syndrome
R005312	[D]Syndrome sleep apnoea
R060200	[D]Orthopnoea
R060400	[D]Apnoea
Z6M..00	Positive pressure therapy
Z6M1.00	Continuous positive airways pressure
Z6M1.11	CPAP - Continuous positive airways pressure
Z6M1.12	Continuous positive airways pressure therapy
Z6M1.13	CPAP - Continuous positive airways pressure therapy
Z6M1100	Intermittent CPAP
Z6M1200	Continuous CPAP
Z6M1300	Periodic CPAP
Z6M2.00	Intermittent positive pressure breathing therapy
Z6M2.11	IPPB - Intermittent positive pressure breathing therapy
Z6M3.11	BIPAP - Biphase pressure airway support
Z6M3.12	Bi-level positive airways pressure therapy
Z6M3.13	BIPAB - Bi-level positive airways pressure therapy

Appendix 6: Read code list for guttate and chronic plaque psoriasis

Code	Description
M16..00	Psoriasis and similar disorders
M160.00	Psoriatic arthropathy

Code	Description
M160.11	Psoriatic arthritis
M160000	Psoriasis spondylitica
M160100	Distal interphalangeal psoriatic arthropathy
M160200	Arthritis mutilans
M160z00	Psoriatic arthropathy NOS
M161.00	Other psoriasis
M161000	Psoriasis unspecified
M161100	Psoriasis annularis
M161200	Psoriasis circinata
M161300	Psoriasis diffusa
M161400	Psoriasis discoidea
M161500	Psoriasis geographica
M161600	Guttate psoriasis
M161700	Psoriasis gyrata
M161800	Psoriasis inveterata
M161900	Psoriasis ostracea
M161A00	Psoriasis palmaris
M161B00	Psoriasis plantaris
M161C00	Psoriasis punctata
M161D00	Pustular psoriasis
M161E00	Psoriasis universalis
M161F00	Psoriasis vulgaris
M161F11	Chronic large plaque psoriasis
M161H00	Erythrodermic psoriasis
M161J00	Flexural psoriasis
M161z00	Psoriasis NOS
M166.00	Palmoplantar pustular psoriasis
M16y.00	Other psoriasis and similar disorders
M16y000	Scalp psoriasis
M16z.00	Psoriasis and similar disorders NOS

Appendix 7: Read code list for glomerulonephritis

Code	Description
K00..00	Acute glomerulonephritis
K00..11	Acute nephritis
K00..12	Bright's disease
K00..13	AGN - Acute glomerulonephritis
K000.00	Acute proliferative glomerulonephritis
K000000	Shunt nephritis
K000100	Crescentic glomerulonephritis
K000111	CGN - Crescentic glomerulonephritis
K001.00	Acute nephritis with lesions of necrotising glomerulitis
K00y.00	Other acute glomerulonephritis
K00y000	Acute glomerulonephritis in diseases EC

Code	Description
K00y100	Acute exudative nephritis
K00y200	Acute focal nephritis
K00y300	Acute diffuse nephritis
K00y400	Acute radiation nephritis
K00yz00	Other acute glomerulonephritis NOS
K00z.00	Acute glomerulonephritis NOS
K01..00	Nephrotic syndrome
K010.00	Nephrotic syndrome with proliferative glomerulonephritis
K011.00	Nephrotic syndrome with membranous glomerulonephritis
K012.00	Nephrotic syndrome+membranoproliferative glomerulonephritis
K013.00	Nephrotic syndrome with minimal change glomerulonephritis
K013.11	Lipoid nephrosis
K013.12	Steroid sensitive nephrotic syndrome
K014.00	Nephrotic syndrome, minor glomerular abnormality
K015.00	Nephrotic syndrome, focal and segmental glomerular lesions
K016.00	Nephrotic syndrome, diffuse membranous glomerulonephritis
K017.00	Nephrotic syn difus mesangial prolifertiv glomerulonephritis
K018.00	Nephrotic syn,difus endocapillary prolifertiv glomerulonephritis
K019.00	Nephrotic syn,diffuse mesangiocapillary glomerulonephritis
K01A.00	Nephrotic syndrome, dense deposit disease
K01B.00	Nephrotic syndrome, diffuse crescentic glomerulonephritis
K01w.00	Congenital nephrotic syndrome
K01w000	Finnish nephrosis syndrome
K01w011	Microcystic type congenital nephrotic syndrome
K01w012	Congenital Finnish nephrosis
K01w100	Drash syndrome
K01w111	Nephrotic syndrome with pseudohermaphroditism
K01w112	Wilms' tumor + nephrotic syndrome + pseudohermaphroditism
K01w200	Congenital nephrotic syndrome with focal glomerulosclerosis
K01wz00	Congenital nephrotic syndrome NOS
K01x.00	Nephrotic syndrome in diseases EC
K01x000	Nephrotic syndrome in amyloidosis
K01x100	Nephrotic syndrome in diabetes mellitus
K01x111	Kimmelstiel - Wilson disease
K01x200	Nephrotic syndrome in malaria
K01x300	Nephrotic syndrome in polyarteritis nodosa
K01x400	Nephrotic syndrome in systemic lupus erythematosus
K01x411	Lupus nephritis
K01xz00	Nephrotic syndrome in diseases EC NOS
K01y.00	Nephrotic syndrome with other pathological kidney lesions
K01z.00	Nephrotic syndrome NOS
K0A..00	Glomerular disease
K0A0.00	Acute nephritic syndrome

Code	Description
K0A0000	Acute nephritic syndrome, minor glomerular abnormality
K0A0100	Acute nephritic syndrome, focal+segmental glomerular lesions
K0A0200	Acute nephritic syn, diffuse membranous glomerulonephritis
K0A0300	Acut neph syn, diffuse mesangial proliferative glomnephritis
K0A0400	Ac neph syn difus endocaply proliferative glomerulonephritis
K0A0500	Acute neph syn, diffuse mesangiocapillary glomerulonephritis
K0A0600	Acute nephritic syndrome, dense deposit disease
K0A0700	Acute nephrotic syndrm diffuse crescentic glomerulonephritis
K0A1.00	Rapidly progressive nephritic syndrome
K0A1000	Rapid progres neph syndrome, minor glomerular abnormality
K0A1100	Rapid progres nephritic syn focal+segmental glomerulr lesion
K0A1200	Rapid progres neph syn diffuse membranous glomerulonephritis
K0A1300	Rpd prog neph syn df mesangial proliferatv glomerulonephritis
K0A1400	Rapid progres neph syn df endocapillary prolifv glomnephritis
K0A1500	Rapid prog neph syn df mesangiocapillary glomerulonephritis
K0A1600	Rapid progressive nephritic syndrome, dense deposit disease
K0A1700	Rapid progres nephritic syn df crescentic glomerulonephritis
K0A2.00	Recurrent and persistent haematuria
K0A2000	Recurrent+persistnt haematuria minor glomerular abnormality
K0A2100	Recur+persist haematuria, focal+segmental glomerular lesions
K0A2200	Recur+persist haematuria difus membranous glomerulonephritis
K0A2300	Recur+persist haemuria df mesangial prolif glomerulnephritis
K0A2400	Recur+persist haemuria df endocaply prolifrtv glomeruloneph
K0A2500	Recur+persist hmuria df mesangiocapillary glomerulonephritis
K0A2600	Recurrent and persistent haematuria, dense deposit disease
K0A2700	Recur+persist haematuria difus crescentic glomerulonephritis
K0A2800	IgA nephropathy
K0A3.00	Chronic nephritic syndrome
K0A3000	Chronic nephritic syndrome, minor glomerular abnormality
K0A3100	Chronic nephritic syndrm focal+segmental glomerular lesions
K0A3200	Chron nephritic syndrom difuse membranous glomerulonephritis
K0A3300	Chron neph syn difus mesangial prolifrtiv glomerulonephritis
K0A3400	Chron neph syn difuse endocap proliferativ glomerulonephritis
K0A3500	Chronic neph syn difus mesangiocapillary glomerulonephritis
K0A3600	Chronic nephritic syndrome, dense deposit disease
K0A3700	Chronic nephritic syn diffuse crescentic glomerulonephritis
K0A4.00	Isolated proteinuria with specified morphological lesion
K0A4000	Isolatd proteinur specfd morphlgcl lesion min glom abnrm
K0A4100	Isolatd proteinur/specifd morphlgcl les foc+seg glom lesn
K0A4200	Isolatd proteinur/specfd morphlgcl les df membrn glomneph
K0A4300	Isolt dprteinur/spcfd morph lesn df mesngl prolif glomneph
K0A4400	Isolt prteinur/spcfd morph les df endocap prolif glomneph
K0A4500	Isolt dprteinur+specfd morph les df mesangiocap glomneph

Code	Description
K0A4600	Isolatd proteinur spcfd morph lesion dense deposit diseas
K0A4700	Isol proteinur specfd morph lesion df crescentic glomneph
K0A4W00	Isolated proteinuria, with unspecified morpholog changes
K0A4X00	Isolated proteinuria, with oth specif morpholog changes
K0A5.00	Hereditary nephropathy not elsewhere classified
K0A5000	Hereditary nephropathy NEC, minor glomerular abnormality
K0A5100	Hereditary nephropathy NEC,focal+segmnt glomerular lesion
K0A5200	Hereditry nephropathy NEC,difus membran glomerulnephritis
K0A5300	Heredtry nephrpthy NEC difus mesangial prolif glomnephrit
K0A5400	Heredtry nephrpthy NEC difus endocapil prolif glomnephrit
K0A5500	[X]Heredtry nephrpthy NEC difus mesangiocapilry glomneph
K0A5600	Hereditary nephropathy, NEC, dense deposit disease
K0A5700	Hereditary nephropathy,NEC,difus crescentic glomnephritis
K0A5X00	Hereditary nephropathy, unspecif morphological changes
K0A6.00	Glomerular disorders in neoplastic diseases
K0A7.00	Glom disordr in blood diseas+disordr invlvg imun mechansm
K0A8.00	Rapidly progressive glomerulonephritis
K0A9.00	Cytomegalovirus-induced glomerulonephritis
Kyu0.00	[X]Glomerular diseases
Kyu0000	[X]Glomerular disorders in infectious+parasitic diseases CE
Kyu0100	[X]Glomerular disorders in neoplastic diseases CE
Kyu0200	[X]Glomerulr disordrs/bld dis+disordr inv immune mechansm CE
Kyu0300	[X]Glomerular disorders in diabetes mellitus
Kyu0400	[X]Glomerulr disordr/oth endocrine,nutritnl+metabolic dis CE
Kyu0500	[X]Glomerular disorders/systemic disorders/connectiv tissue CE
Kyu0600	[X]Glomerular disorders in other diseases CE
Kyu0700	[X]Rapidly progressive nephritic syndrome, other
Kyu0800	[X]Unspecif nephritic syndr, minor glomerular abnormality
Kyu0900	[X]Unsp nephrit synd, diff mesang prolif glomerulonephritis
Kyu0A00	[X]Unsp nephrit synd, diff endocap prolif glomerulonephritis
Kyu0B00	[X]Unspecified nephritic syndrome, dense deposit disease
Kyu0C00	[X]Unspecif nephrit synd, diff concentric glomerulonephritis
Kyu0D00	[X]Isolated proteinuria, with oth specif morpholog changes
Kyu0E00	[X]Isolated proteinuria, with unspecified morpholog changes
Kyu0F00	[X]Hereditary nephropathy, unspecif morphological changes
SP08b00	De novo glomerulonephritis

Appendix 8: Read code list for other sleep disordered breathing

Code	Description
1C7..00	Snoring symptoms
1C72.00	Snores
1C7Z.00	Snoring symptom NOS
2DB..11	O/E - tonsils enlarged
2DB3.00	O/E - tonsils mod. enlarged

2DB4.00	O/E - tonsils grossly enlarged
3148.00	Sleep studies
38Da.00	Berlin questionnaire for sleep apnoea
7065800	Sleep studies
7065A00	Sleep studies NEC
7527800	Injection snoreplasty
7527900	Radiofrequency somnoplasty
7P1B000	Polysomnography
9b9Y.00	Sleep studies - specialty
H141.00	Tonsil and/or adenoid hypertrophy
H141.11	Adenoid hypertrophy
H141.12	Enlargement of tonsil or adenoid
H141000	Hypertrophy of tonsils and adenoids
H141100	Hypertrophy of tonsils alone
H141200	Hypertrophy of adenoids alone
H141z00	Hypertrophy of tonsils and adenoids NOS
H1yz200	Upper airway resistance syndrome
R060B00	[D]Snoring

Appendix 9: Read code list for tonsillectomy and adenotonsillectomy

Code	Description
7530.00	Excision of tonsil
7530.11	Tonsillectomy
7530000	Dissection tonsillectomy
7530100	Guillotine tonsillectomy
7530200	Bilateral laser tonsillectomy
7530300	Other bilateral tonsillectomy
7530400	Excision of remnant of tonsil
7530500	Excision of lingual tonsil
7530600	Tonsillectomy and adenoidectomy
7530700	Other unilateral tonsillectomy
7530800	Dissection tonsillectomy and adenoidectomy
7530900	Guillotine tonsillectomy and adenoidectomy
7530A00	Bilateral dissection tonsillectomy
7530B00	Bilateral guillotine tonsillectomy
7530C00	Coblation tonsillectomy
7530D00	Bilateral coblation tonsillectomy
7530y00	Other specified excision of tonsil
7530z00	Excision of tonsil NOS